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Transiliac Bone Biopsy

Complications and diagnostic value

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This article reviews the experience of 101 transiliac bone biopsies performed in one year at Henry Ford Hospital and discusses the possible diagnostic value of the procedure in evaluating generalized metabolic bone disease. In 50 of the 101 cases, we used a pain scoring method to evaluate the acceptability of the procedure to patients. Data from our study and 18 other clinical centers were then analyzed for: 1) demographic distribution of patients who had a bone biopsy; 2) its acceptability to patients; 3) quality of the specimen and its relationship to the physician performing the procedure; 4) diagnostic yield of bone biopsy; and 5) complications of the procedure. Transiliac bone biopsy is reasonably acceptable to patients and does not sacrifice the quality of bone needed for diagnostic purposes. With improved instrumentation, it can be performed on outpatients and does not require elaborate physical facilities. We conclude that transiliac bone biopsy should be performed on all patients with metabolic bone disease unless the diagnosis is obvious.

Histologic examination of tissue biopsy specimens has become an integral part of medicine. With improved instrumentation many procedures can now be performed in outpatients and do not require elaborate physical facilities. Transiliac bone biopsy is no exception (1,2). It provides an adequate sample both for diagnosis and for micromorphometric and histodynamic study of bone in various metabolic bone diseases. While bone biopsy has been a routine procedure to identify local lesions for some decades, its use in evaluating generalized metabolic bone disease has received little attention. Although transiliac bone biopsy is considered a research tool by many physicians, this article describes its use as a diagnostic aid in the field of bone and mineral metabolism. The detailed technique of performing a bone biopsy is discussed elsewhere (3). Essentially it consists of removing a small core of cortical and trabecular bone from the ilium approximately 3 cms posterior and 3 cms inferior to anterior superior iliac spine, through a small skin and muscle incision (3).

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Materials and Methods

Between January and December 1979, 101 transiliac bone biopsies were performed by three physicians (A, B, and C) at Henry Ford Hospital. Physician A learned the procedure from physician C and taught it to physician B. In vivo, double tetracycline labeling was used for all patients prior to bone biopsy, so that measurements of histodynamic data on the specimen could be made (4,5).

As a part of the study, data from 18 clinical centers where bone biopsies are performed were pooled for analysis of complications (6). Data were analyzed for: 1) demographic distribution of patients who had a bone biopsy; 2) its acceptability to patients (see pain score below); 3) quality of the specimen and its relationship to the physician performing the procedure; 4) diagnostic yield of bone biopsy; and 5) complications of the procedure.

To determine a pain score, we assessed patient discomfort on a scale of 0 to 4: 0, no discomfort; 1, mild; 2, moderate; 3, severe; 4, excruciating or unbearable. Pain scoring was done only for patients of physician A and was initiated during the latter part of the study so that a total of only 50 consecutive patients were available for analysis. Scoring

was done once at the end of the procedure and again when sutures were removed seven days later. Ancillary personnel and the patient's own physicians helped in overall assessment of pain score.

Results

There were 85 women and 16 men (Table I). As a group, men were five years younger than women, but the mean value was not significantly different. Black men were the youngest of the group (<50 years of age), but in each patient a secondary cause for accelerated bone loss was present: two had renal osteodystrophy, one had total gastrectomy for Zollinger-Ellison syndrome, and one had insulin-dependent diabetes mellitus. The pattern of distribution by age, sex, and race is similar to that for osteoporotic patients in general.

Fifty patients were evaluated for pain by the pain scoring method. A further analysis related the pain score to the number of bone biopsies each patient received (Table II). Thirty-eight patients (76%) considered the discomfort as '0' or '1'. Twenty-seven had the procedure for the first time and 10 for the second time, eight of whom scored their discomfort as '1'. We could not assess the previous experience of these eight patients, since the biopsy had been performed by a different physician and the pain score had not been determined. However, they admitted that the second procedure was less painful than the previous one. Patients' knowledge of the procedure or the physician's technical expertise or both could have contributed to their assessment of less discomfort. This assumption is supported by the fact that one patient scored '0' even at the fourth encounter. Eleven patients (22%) scored '2' (nine were first encounters and two were third encounters). In the latter two patients, biopsies were performed by the same physician (physician A) on each of the three encounters. They accepted the procedure because of its value in their management, despite considerable discomfort experienced. One patient (2%) scored '3', and none scored '4'.

TABLE I
Characteristics of Population Studied

Race and Sex	Number	Age (Years) (Mean ± SD)
White Women	74	60.0 ± 11.9
White Men	12	55.7 ± 11.0
Black Women	11	62.2 ± 8.7
Black Men	4	48.7 ± 2.0
Total		
Women	85	60.3 ± 11.6
Men	16	54.3 ± 10.3

TABLE II
Pain Score (Physician A Only)

Score	No. of patients	No. of patients in each encounter			
		1st	2nd	3rd	4th
0	12	9	2	—	1
1	26	18	8	—	—
2	11	9	—	2	—
3	1	1	—	—	—
4	0	—	—	—	—

Quality of the bone specimen was satisfactory in 88 (88%) cases (Table III). Physician B obtained the highest number of unsatisfactory specimens, and physician A the least. Both physician A and C had previously performed more than 150 transiliac bone biopsies, whereas physician B had no previous experience. Thus, the quality of specimen relates to the experience of the physician who performs the procedure. Twelve specimens (12%) were unsatisfactory (fragmented, one cortex missing, crushed trabeculae, etc), but were sufficient for diagnostic purposes. The mean volume of bone specimen was 0.2723 cm^3* (0.1130 - 0.5770 cm^3). Geometric shape, technical artifacts and, presumably, underlying metabolic process all might have contributed to the wide variation in bone specimen volume.

Histologic diagnoses of bone biopsy showed osteoporosis in 83 patients, osteomalacia in 11, and renal osteodystrophy in 7. Among 83 patients with osteoporosis, 9 (11%) had a skeletal imbalance consisting of a dichotomy between cortical and trabecular histodynamics, 15(18%) had a high turnover of bone (i.e., increased cellular activity of both osteoblasts and osteoclasts), and 59 (80%) had a low turnover of bone (i.e., decreased cellular activity of both osteoblasts and osteoclasts). Clinical, biochemical, and radiologic features of the last two groups with osteoporosis were indistinguishable. In four of 11 patients with histologic osteomalacia, laboratory data were inconclusive so that the diagnosis was established exclusively by bone biopsy. Two patients with renal osteodystrophy had features of predominant osteomalacia, four showed features of excess parathyroid hormone effect, and one showed improvement of osteomalacia as a therapeutic response. One patient in the entire group showed osteomalacia that was totally unexpected and is still under investigation for proper diagnosis. Table IV illustrates the complications from the bone biopsy.

One patient with renal osteodystrophy developed local hematoma as a result of the procedure, probably related to

* $V=Lx3.14x(D/2)^2$. Where L is the length of the specimen, which in turn reflects the thickness of the ilium; D is the diameter of the specimen which cannot exceed 0.7 cm.

heparin use during subsequent hemodialysis, and it resolved spontaneously. Bone specimens were lost internally (between the iliacus muscle and inner aspect of the ilium) or externally (external to the bone in subcutaneous tissue under the fascia lata). Eight specimens lost externally were retrieved easily by digital exploration without additional discomfort to the patient. Two specimens lost internally (one each by physicians A and C) were left in vivo; both patients were informed but neither developed any long-term complications as a result. In both cases, a second biopsy was done adjacent to the previously attempted site. In another case, the cutting end of the trephine separated from the shaft after pentrating the outer cortex of the ilium but was removed with a pair of pliers. A successful second attempt was made without complications. Interestingly, this patient's pain score was '1'. None of our patients experienced complications such as femoral nerve palsy (transient or permanent), skeletal fractures (local or distant), wound infections, or osteomyelitis. A few patients experienced local dysesthesia for up to four months, but it resolved completely with time.

Discussion

At present, several types of instruments and approaches for obtaining a bone biopsy are available (3). Transiliac bone biopsy is probably the method most often used since the ilium is an easily accessible site. A lateral approach (1) offers the best opportunity for obtaining a full thickness (with both inner and outer cortices of ilium) iliac bone specimen of good quality and of sufficient quantity.

TABLE III
Quality of Specimen

Physician	Total	Satis-Factory	Unsatis-Factory	% Unsatis-Factory	Previous Experience
A	48	44	4	8%	Yes
B	42	35	7	17%	No
C	9	8	1	11%	Yes

TABLE IV
Complications of Transiliac Bone Biopsy

Complications	No. of patients	%
Total Number of patients	101	100
Hematoma	1	1
Instrument problem	1	1
Specimens lost*	2	2
Femoral nerve palsy	—	—
Wound infection	—	—
Skeletal fracture	—	—
Osteomyelitis	—	
Total	4	4%

* See text for explanation.

TABLE V
Bone Biopsy Complications

	Transiliac Trephine	Iliac Crest
No. of Cases	9,030	5,780
Hematoma	21	14
Neuropathy	11	2
Wound infection (Skin)	6	4
Pain (7 days)	17	—
Fracture	2	—
Osteomyelitis	1	—
Total No. of Complications	58* (0.64%)	20* (0.35%)

* Not significantly different.

Complications are either transient or non-existent. Pain is the single most common complication, but it is reasonably well accepted, as described above. In a larger survey of 9,030 transiliac bone biopsies compiled from 18 major centers, the incidence of complications was similar to those of this study (Table V). Furthermore, the incidence did not significantly differ between the superior (needle trephine) and lateral (transiliac trephine) approach nor between the instruments used. Patient acceptability is good, as shown by the data presented here and as has been reported in a similar study (7). If necessary precautions are taken (3), the procedure is no more complicated than any other form of biopsy. Contrary to the previous report (3), incision of subcutaneous tissue and fascia lata, rather than blunt dissection, greatly minimizes the discomfort of patients during or for several days after the procedure. The incised fascia lata must be sutured with interrupted, absorbable chromic material to avoid herniation of underlying muscle.

Diagnostic usefulness of bone biopsy is evident when the spectrum of histologic findings within the same disease entity is considered. Although noninvasive techniques (clinical, biochemical, and radiologic) are often helpful, a small but significant number of patients will require bone biopsy either to confirm the diagnosis or guide therapeutic decision. This is particularly important in patients with osteoporosis and with renal osteodystrophy, where the nature of bone disease is not always obvious (8). In another group of patients with postgastrectomy osteopenia (9), 25% had osteomalacia, despite normal dietary intake of calcium and calciferol. None of the laboratory data were helpful in predicting bone histology in this group (9).

In summary, transiliac bone biopsy can be performed in outpatients with minimal discomfort. It is reasonably acceptable to patients without sacrificing the quality of bone needed for diagnostic purposes. Because of its ease and high diagnostic yield, it should be performed in all patients with metabolic bone disease unless the diagnosis is obvious.

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